

(54) **SOFT METAL CONDUCTOR AND METHOD OF MAKING**

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- (\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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- (58) Field of Search ..... **257/750-752, 257/758, 759, 762-765, 767, 771**

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(57) **ABSTRACT**

A soft metal conductor for use in a semiconductor device which has an uppermost layer consisting of grains having grain sizes sufficiently large so as to provide a substantially scratch-free surface upon polishing in a subsequent polishing step. The invention also provides a method for making a soft metal conductor that has a substantially scratch-free surface upon polishing by a multi-step deposition process, i.e., first sputtering at a higher temperature and then sputtering at a lower temperature and followed by another high temperature sputtering process. The invention further discloses a method for forming a substantially scratch-free surface on a soft metal conductor by first depositing a soft metal layer at a low deposition temperature and then annealing the soft metal layer at a higher temperature to increase the grain size of the metal. The invention also discloses a dual-step deposition method for making a soft metal conductor for use in an electronic device by first depositing a first layer of metal by a physical vapor deposition technique to a first thickness, and then depositing a second layer of metal on top of the first layer of metal to a second thickness larger than the first thickness by a method of chemical vapor deposition, electroplating or electroless plating. The first deposition process may further be conducted by a chemical vapor deposition technique, with the second deposition process conducted by a physical vapor deposition technique.

**16 Claims, 4 Drawing Sheets**

